

ABSTRACT

50-kW AMBIENT PRESSURE PEM FUEL CELL POWER PLANT DEVELOPMENT

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Under contract to the United States Department of Energy and the Ford Motor Company, International Fuel Cells is developing a 50-kilowatt hydrogen-air PEM power plant for automotive application. The key specification requirements for the power plant are:

Near Term	Power:	50 kilowatts net
	Fuel:	Hydrogen
	Oxidant:	Air
	Specific Weight:	≤ 6 lbs/kW
	Output Voltage:	≥ 250 volts DC
	Catalyst Loading:	< 0.25 mgPt/cm ²
Ultimate	Power:	50 kilowatts net
	Fuel:	Hydrogen
	Oxidant:	Air
	Specific Weight:	≤ 4 lbs/kW
	Output Voltage:	≥ 250 volts DC
	Catalyst Loading:	≤ 0.25 mgPt/cm ²
	Specific Volume:	≤ 0.07 cu.ft./kW
	Specific Cost	$\leq \$50/\text{kW}$

A preliminary engineering sketch of the power plant is shown in Figure 1. An engineering model of one of the two stacks for the power plant is shown in Figure 2. The stack design is based on tests of a full-scale short stack of identical cells. The power plant will weigh less than 6 lbs/kW and will occupy fewer than 8 cubic feet. Its output voltage at 50 kW is nominally 270 volts.

The power plant is based on IFC's passive-water-management PEM concept which enables operation at ambient pressure (1 psig) and greatly simplifies the power plant accessory system. The power plant's major ancillaries are limited to an air blower and a water circulation loop comprised of a pump, control valves, and interconnecting plumbing. No compressor or saturators are required and no recycle of hydrogen or air is necessary. The passive-water-management concept was demonstrated in a design of practical and low cost materials in IFC's PC27 20-kW power plant, see Figure 3.

Because passive-water-management simplifies the power plant and enables efficient high power density operation at near-ambient pressure, our concept has the best potential for meeting automotive weight, volume and cost goals. The power plant, which meets the near term specifications, will be under test by August 1997.

We have additional work proceeding, in parallel with the power plant development, which is advancing the technology to the ultimate specification requirements.